

REMARKS/ARGUMENTS

Claims 1-3 are pending in the present application. No additional claims fee is believed to be due.

Art Rejections

Claims 1-3 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Pathasarathy et al. (U.S. 6,251,815) in view of Yang (U.S. 5,549,151). Applicants submit that in light of the following arguments, the above identified references would not have led one skilled in the art to the invention as set forth in the claims.

Pathasarathy et al. relates to fiber-reinforced composites. More particularly, it relates to fiber-reinforced ceramic matrix composites having a gradient in thermal expansion coefficient across at least one dimension of the component. The matrix composite materials used in Pathasarathy et al. are ceramic. Whereas, in the present invention, the fiber-reinforced matrix composite materials are a metal-ceramic composite. Importantly, Applicants have discovered that use of a metal region greatly enhances composite properties such as thermal conductivity and/or load-bearing capacity. As the Examiner is aware, there is nothing in Pathasarathy et al. which teaches or suggests the use of metal-ceramic materials, let alone the use of metal-ceramic composite materials having a graded ceramic-metal zone.

Yang relates to a method for forming a metal matrix composite material having graded properties. In contrast to Applicants' claimed invention, the metal matrix composite material in Yang is not fiber-reinforced, but rather is reinforced by particulate fillers. Furthermore, it is clear from the processing method described therein, that the metal in Yang is a continuous phase. The gradation is obtained entirely by using particulate filler materials in the metal matrix. Thus, the processing method used in Yang precludes the possibility of a 100% ceramic material. This is a very important difference because the temperature use range of the Yang material will be limited by the metal. Even for the lowest metal content achievable by the method of Yang, the

material will remain a metal-cemented filler material subject to the ultimate temperature limits of the metal phase. This is a severe limitation and renders the Yang et al materials wholly unsuitable for high temperature applications.

In contrast, the matrix in Applicants' invention is not continuous. The matrix varies from 100% metal on one side to 100% ceramic on the other side as recited in Claim 1 herein. In other words, the hottest portion of the composite, not just at the surface but through some thickness, is 100% structural ceramic composite with no metal content at all. This is important because that portion of the composite is intended to be used at temperatures above the use temperature of typical metals and/or continuous metal-matrix composites (such as disclosed in Yang). In short, a closer examination of the Yang reference shows that it describes very different materials than claimed in the present invention.

Moreover, it would not have been obvious to one having ordinary skill in the art to combine the teachings of Pathasarathy et al., which is directed to fiber-reinforced ceramic composites, with those of Yang which is directed to a specific method for forming a metal matrix composite material reinforced with particulate fillers. The references are clearly nonanalogous art.

Furthermore, even if one were to combine the teachings of Pathasarathy et al. with the Yang reference as the Examiner suggests, the combination would fall short of Applicants' claimed invention. As discussed above, there is nothing in Pathasarathy et al. which teaches or suggests the use of metal-ceramic materials. Whereas, the processing method disclosed in Yang of making a metal matrix composite material reinforced by particulate fillers, precludes the possibility of a 100% ceramic material. So combining the references would not lead to a fiber-reinforced matrix material varying from 100% metal on one side to 100% ceramic on the other side as recited in Claim 1 herein.

In short, it is respectfully submitted a full consideration of the Pathasarathy et al. reference in view of Yang would not lead the skilled Artisan to Applicants' claimed invention as set forth in Claims 1-3 as herein.

Conclusions

In light of the above amendments and foregoing remarks, Applicants believe that Claims 1-3 are now in form for allowance. Accordingly, it is respectfully requested that the claims be reconsidered, the rejections under 35 U.S.C. 103(a) be withdrawn, and the claims as amended herein be allowed. Should the Examiner have any questions or wish to further discuss this matter, it is requested that the undersigned attorney be contacted at (937) 904-5031.

Respectfully submitted,

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